

## ABSTRACT

An apparatus for coherent wavelength-shift multiplexing splits a photonic signal of limited coherence length into a plurality of daughter signals. Each daughter signal is modulated with a modulation waveform configured to shift the wavelength of the photonic input signal and provide a photonic output signal with a unique wavelength pattern corresponding to a channel. Each photonic output signal corresponding to a data channel is also encoded with a data signal by pre-modulating the modulation waveform. Wavelength errors are detected to provide a wavelength error signal. The wavelength error signal is used to adjust the modulation waveforms to stabilize the wavelength of the photonic output signals and correct channel wavelength errors. Fixed wavelength channels and spread spectrum channels are supported by the present invention. The photonic output signals are combined onto a single medium to provide a multiplexed photonic signal.

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